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ASTROLOGY*

BY ALFRED BAKER

Superstition is associated with a very curious phase of mentality. It is not easy to give a definition of superstition. It will not do to say that it consists in ascribing insufficient or false causes to events, for then many ephemeral scientific hypotheses would be included as superstitions; nor will it do to say that it is the ascription of supernatural causes to events, for then reliance on Providence becomes a superstition. The trouble is that what to one man is a matter of confident belief, to another is a superstition. Constancy thus disappears.

It is, however, an easy matter to furnish illustrations of it: seeing new moon over left or right shoulder, raising an umbrella in the house, Banshee, Friday, thirteen, spilling salt, touching wood, sneezing, the evil eye, sticking pins in images made to represent enemies, walking under a ladder, breaking looking glasses. It is safe to say that almost everyone in this audience has some favourite superstition, though I shall not follow the example of the itinerant evangelists and ask those without superstition to stand up.

*A paper read before the Royal Astronomical Society of Canada.

Classes of people are very liable to be superstitious whose environment or dealings involve influences which they cannot control,—sailors, brokers, card-players.

In the main superstition is the child of ignorance, though many very able men have been its victims. It really comes down to us from our days of savagery; it is a remnant of barbarity; and in the process of evolution through which the race has passed it is one of those primitive characteristics which have not yet been eliminated.

Of the many forms of superstition that at various periods have swayed our race,—pagan, Christian, Jewish or Mahommedan,—without doubt the most interesting is astrology.

It was so widespread.

Belief in it has existed for so long a time.

It dominated so many persons conspicuous in history.

In literature there are frequent references to it.

It was associated with the science of astronomy.

It required a certain amount of scientific knowledge for its practice.

Its association with the heavenly bodies gave it a glamour and dignity which attached to no other superstition.

I offer then no apology for introducing so remarkable a subject to the notice of even so highly intelligent an audience as this which I see gathered here to-night.

Astrology, as you are all doubtless aware, is the pseudo-science which professes to devise methods for foretelling the future, and in general for determining the unknown, by means of the planets and stars. It is based on the assumption that the celestial bodies influence and determine our human affairs even in their most minute details; or at least that such parallelism or correspondence exists between the configuration of the heavenly bodies and mundane matters, that by properly interpreting the former we may become acquainted with the latter. I have no intention of dealing with the general question—Is it possible to foretell the future? Space and time are very curious things in their ultimate analysis. We have means which enable us to see beyond the point in space at which we happen to be: why should there not be means for knowing beyond the point of time at which we are? If the future

is a necessary consequence of the present, a proper appreciation of the present, combined with a knowledge of the laws of cause and effect, will reveal the future. It is not, however, on any method so philosophically constructed that systems of vaticination have been based. In the main the soothsayer, irresponsible and effortless, professed to be but the mouthpiece of the divinity. In interpreting the flight of birds and the entrails of the victim the priest professed to be merely the revealer of the correspondence which the Deity had established between these phenomena and human affairs. The astrologer professed to reveal the correspondence which the Deity had established between celestial configurations and human affairs. But astrology received a scientific colouring from its association with the undoubted science of astronomy; a certain amount of scientific knowledge was necessary to practice it; its methods were professedly inductive, and in other ways quasi-scientific; and it received great dignity and impressiveness from its claim that the stars influenced and revealed the destiny of mankind.

One is apt to consider it remarkable that astrology should for centuries have maintained its hold, when the continual falsification of its predictions must have revealed the hollowness of its pretensions. The explanation is to be found in our intense desire to know the future. We even yet, even the clearest-headed amongst us, receive with eager credulity, or at least with interest, any one who professes to reveal the unknown. If an old woman were telling fortunes in the next room, you would not stay here to listen to me. The astrologer had not to create a market for his goods; he had not to educate the people up or down to his science. They stood eager to hear him, and what told still more strongly in his favour, keenly eager to believe him. Thus it was that one success in prediction did his business more good than a thousand failures could do it harm. The one success was remembered, while the thousand failures were forgotten. We continue to call in the doctor though he does not every time effect a cure.

But in addition to all this it was by no means the easy matter you may imagine to convict astrology as a system of humbug. The safeguard of the oracles of antiquity was the ambiguity of their utterances. This ambiguity was far more marked in astrology.

A horoscope, by reason of the vast variety of the constructions that could be put upon it, was a mass of ambiguity. Thus it came to pass that the astrologers could always claim that they had incorrectly interpreted the horoscope,—the science of astrology was all right, their knowledge of it was faulty. To illustrate this: In 1552 Cardan, the distinguished Italian mathematician, astrologer and physician, went to Scotland to prescribe for the archbishop of St. Andrews. On his return through London, Cardan stopped with Sir John Cheke, Professor of Greek at Cambridge, and tutor to King Edward VI. The King's guardians, anxious to know how long the king would live (anxiety for themselves, by the way, not for the king), had his horoscope cast by Cardan. It is still extant. Perhaps the most striking feature in it is the presence of Jupiter in the mid-heaven, which is usually held to betoken a very splendid and successful career. At all events Cardan predicted that Edward would live beyond middle life, though after the age of 55 yrs. 3 mos 17 days he would be the victim of various diseases. The king died about 9 months afterwards at the age of 16. Cardan felt called upon to defend himself and in effect said that a weak nativity could never be satisfactorily treated from a single horoscope, but that to ensure success he should have cast the horoscopes of all those with whom Edward was brought into intimate relations. Cardan, by the way, predicted that he himself should die on a particular day, and was obliged to commit suicide in order to maintain his reputation and that of his science. Cardan hated Luther and changed his birth-day so as to give him an unfavourable horoscope.

The practice of astrology stretches back to the most remote antiquity. Its origin, I think, is clearly to be found in the worship of celestial objects. It was easy and natural to pass from the worship of the sun, moon and stars to the thought that they influenced human destiny. We owe astrology to the Chaldeans, not to the Greeks. It was introduced amongst the Greeks after the time of Alexander, and by them was never cultivated with fondness, though they gave it a complexity, an appearance of exactness, a scientific cast, which it could never possibly have received from its Oriental originators. The Chaldeans contemplated the heavens for vast ages without, so far as we are aware, contributing a single fragment to scientific astronomy. But though the Orientals were

incapable of originating a science, they were quite capable of originating a superstition. Their astronomy is described as having throughout an astrological cast.

Astrology is referred to several times in the Old Testament, and never with approbation: In Isaiah xlvii. 13 we have "Thou art wearied in the multitude of thy counsels. Let now the astrologers, the star-gazers, the monthly prognostigators, stand up and save thee from these things that shall come upon thee" (Time of Cyrus, B.C. 559). There are half a dozen references to the subject in the Book of Daniel.

Berosus, a Chaldean contemporary of Alexander the Great, is credited with having introduced astrology into Greece. There it gradually gained ground, and passed into acceptance as one of the modes of divination. Greek influence on astrology is interesting as being illustrative of the character of that gifted people. Sir George Cornewall Lewis says "Astrology, as practised in the first centuries of the Roman Empire, was an intricate and abstruse system. . . . It involved more reasoning, and demanded more constructive ingenuity, than the modern pseudo-sciences of phrenology and homoeopathy. Even for his own objects of superstitious imposture, a Chaldean or an Egyptian would have been unable, without the assistance of a higher intelligence, to produce so refined an instrument as the genethliac astrology. It required the intellectual gifts of the Greeks to give it the precision and finish, and the false lustre of a scientific method, which it obtained in their hands". It is not difficult to understand how clever Greeks, with scientific bent, might practice astrology by reason of the great profit it brought in, without permitting themselves to be deceived by it.

From Greece the art passed into Italy and Rome. In 139 B.C. an edict was issued expelling the Chaldeans (as astrologers were called; also called mathematicians) from Italy, I conjecture because they began to cut into the profits (vested rights) of some established form of vaticination. Towards the close of the Republic, astrology must have been much in vogue. Cicero was not its friend. He pointed out that not one of the futures foretold for Caesar, Pompey and Crassus was verified by their after lives. The planets, he said, being infinitely distant could not affect us. Twins

have practically the same horoscope, yet their lives might be essentially different. The reply of the astrologer Publius Nigidius Figulus to this objection was sufficiently apt. He directed an opponent of the art to make two contiguous marks on a potter's wheel which was revolving rapidly near them. When the wheel was stopped and examined, the marks were found to be far removed from one another. A story is told of the Emperor Tiberius which shows that astrologers who did business for that amiable gentleman had sometimes to think quickly. Those who were brought to Tiberius on any important matter were admitted to an interview in an apartment situated on a lofty cliff on the island of Capri. They reached this place by a narrow path overhanging the sea, accompanied by a gigantic freedman of prodigious strength; on their return if the emperor had any misgivings as to their trustworthiness, a single blow buried the secret and its victim in the sea. After the astrologer (Thrasyllus) had stated the results of his art as it concerned the emperor, the latter asked him whether he had calculated how long he himself had to live. Thrasyllus examined the aspect of the stars and was seized with an agitation which we may readily believe was not simulated. He at last declared that the present hour was with him critical, perhaps fatal. Tiberius embraced him, and told him he was right in thinking he was in danger, but that he should escape it; and made him thenceforth a confidential counsellor. The story reveals an ingenuousness in Tiberius with which he is not generally credited. The reply of Thrasyllus was hardly as clever as that of an astrologer to that interesting ruffian Louis XI. The king had consulted the astrologer about a certain matter, and had received an unpalatable reply which had evidently led him to conceive an aversion to the soothsayer. Louis thereupon enquired whether the astrologer had determined how long he himself was going to live. With a readiness which under such critical and embarrassing conditions is astounding, the savant replied that he had some time before cast his own horoscope, and found that he would pre-decease his majesty by about a month. It is needless to say no harm befel him.

From Italy and Rome, no doubt also in part from Spain during its occupation by the Moors (for the Arabians received the superstition from the Greeks), the practice of astrology spread all over

the continent of Europe. In the middle ages it fairly boomed. Almost every physician and man of science in mediaeval Europe was an astrologer. The practice of medicine and the practice of astrology were often, indeed I may say were usually, combined. Kepler maintained himself by casting horoscopes. He says, "Nature which has conferred upon every animal the means of subsistence, has designed astrology as an ally of astronomy". The language suggests that he thought it more valuable for the income it brought in than for the future it professed to reveal. He charged heavy fees, and left at his death a considerable sum of money.

Tycho Brahe gave much attention to the comet of 1577, and declared that it announced there should be born in Finland a prince who should lay waste Germany and die in 1632. Gustavus Adolphus was born in Finland, overran Germany, and died in 1632.

Henry II of France was killed in a tournament by a thrust in the eye through the bars of his helmet. It is said that Nostradamus predicted this three years before it happened. The same French astrologer predicted that "the Christian religion would be abolished in France, and many of the nobles and clergy put to death". This is regarded as a prediction of the French Revolution 242 years before the event. Raphael seems to think the 242 years the surprising element in this prophecy. Less credulous people will think it explains everything. One may make almost any prediction if two centuries and a half be allowed for it to accomplish itself. A tale is told of a Persian minister who promised the Shah that he would teach his favourite ass to speak within 10 years. "In 10 years" said the minister to himself, "the Shah, or the ass, or I myself may be dead". Louis's prediction was much cleverer because more definite,—"Apres moi le deluge".

Michael Scott, a mathematician and astrologer of the thirteenth century predicted that the Emperor Frederic II should die at Florence, which happened. The same astrologer predicted that he himself should die from the fall of a stone. Being in church one day at his devotions a stone fell from the roof, inflicting a mortal wound.

The following is told of Flamsteed (1646-1719), the first astronomer royal. An old lady had lost some valuables and appealed to the astronomer to use his observatory to discover them. He refused

of course to trouble himself about the matter; but she was very insistent, and approached him again and again. At length wearied to death, and thinking the best way to get rid of her was to make a prediction—that would necessarily prove false—and so destroy her confidence in him, he made a drawing of her house and grounds, drew circles about it, and introduced at random some magic signs. Striking a spot (possibly with his eyes shut) in the drawing he said "Dig there and you will find it". The lady dug in the spot indicated and did find it. It is said that Flamsteed attributed the result to the direct action of the devil. The old lady's belief in the value of observatories was not diminished.

The most distinguished astrologer of whom England can boast is possibly William Lilly who belonged to the reign of Charles I, to the period of the Commonwealth, and to part of the reign of Charles II. It is usually said that he predicted the great plague and great fire of London fifteen years before they occurred. The true story is as follows: In 1651 (Charles executed June 30th, 1649) Lilly published a pamphlet entitled "Monarchy or no Monarchy in England", and in it were given two rude cuts, one suggestive of excessive mortality and the other of a conflagration, but, significantly, he gave no date at which these were to occur. At such a time plagues were not uncommon and conflagrations were very possible. Besides he could very easily have subsequently interpreted the first drawing to refer to excessive mortality in consequence of a great battle, and the second to refer to any disaster to London or indeed to England. He cunningly made no comment on the drawings, thus leaving himself free in his interpretation.

In Raphael's Astrology I find the following odd statement:

"In a volume of Lilly's Astrology, purchased at the sale of the Duke of Marlborough's library, there is the following curious note: 'The immediate use which Charles I made of £1000, which was sent to him at Hampton Court, was to consult Lilly the astrologer. "I advised him", says the sage, "to travel eastward, whereas he travelled westward, and all the world knows the consequences'".

Whether any advice would have been of use to Charles I is open to question.

A curious story is related of the poet Dryden. It is said that

on the birth of his son Charles he cast his nativity. Some time afterwards he stated to his wife that the child had been born in an evil hour; for Jupiter, Venus and the sun were all under the earth and the lord of his ascendant afflicted with a hateful square of Mars and Saturn. "If he lives to arrive at his 8th year", said Dryden "he will go near to die a very violent death on his very birthday; but if he escape, he will, in his 23rd year, be under the same evil direction; and if he should escape that also, the 33rd or 34th year will I fear—" Here he was interrupted by his wife who could no longer listen to the prediction of calamity to her son". The verification of this prophecy is related with much circumstantiality in Ennermoser's "History of Magic".

I have already referred to the influence of astrologers with royal and princely people in the middle ages. No portrayal of the character of Catharine de Medici would be complete that did not introduce Ruggieri and his life at Chaumont and at Blois. Francis I and Charles V were in constant consultation with astrologers. Astrology is at present practiced in India; and the other day a distinguished astrologer died in New York, I doubt not in very comfortable circumstances. There is a "School of Astrology and Palmistry" flourishing at Atlantic City, N.J. There is an Astrological Magazine, called the "Sphinx" published,—where do you think?—in Boston.

Interesting work could be done by those who are occupied with literary studies in examining the influence of astrology, or traces of it, in various directions. I should like to know to what extent evidences of this popular superstition are to be found in Shakespeare, and suggest the enquiry to students of English literature. Allusions to it are met with in Milton. Surely no one can properly elucidate Schiller's "Wallenstein" without some knowledge of astrology. It is quite certain that Schiller himself had a considerable acquaintance with it; and anyone who reads Coleridge's marvellous translation of "Wallenstein" must see that the translator was by no means unacquainted with the details of the superstition.

The words *contemplate, consider, jovial, saturnine, mercurial, ascendency, disastrous*, and the phrases, "*his star is in the ascendent*", "*star of destiny*", are survivals of astrology.

It is the custom for historians to say that though astrology and

alchemy were false or futile, they were nevertheless of great value in advancing the sciences of astronomy and chemistry. This is true of alchemy, but, I think, untrue of astrology. The men who advanced astronomy, even if they practised astrology, scarcely believed in it. Astronomy is not, like Chemistry, an experimental science. It was advanced by men seeking to find the mechanism of the universe. A knowledge of the mechanism of the universe was not necessary for the practice of astrology. Indeed astrology with its fundamentally geocentric conception of the universe probably delayed true astronomical progress.

I have since found that in an article on astrology in "Knowledge" (Feb. 1st, 1900), E. Walter Maunder expresses the same view.

Astrology fell into desuetude *gradually*, in consequence of the gradual increase and diffusion of the rationalistic spirit amongst the people. I use the words "rationalistic spirit" not with any theological reference. It is the disposition to demand evidence in respect to a theory, and the power to estimate evidence. Astrology always had its opponents; it even yet has its advocates. There has been through the centuries a gradual increase of the former and a gradual decrease of the latter. I have mentioned instances of the alleged fulfilment of astrological predictions, not with the view of making you think there may after all be something in the system, but expressly to show you that however absurd a system of forecasting the future may be, it will, by mere coincidence sometimes be fulfilled. Such is the scientific value of such fulfilments; they illustrate nothing more mysterious than the doctrine of probability, and the chances of coincidence.

It claimed to be an inductive science, which had not as yet by any means reached finality. Its votaries were continually making fresh discoveries. Thus if it were discovered that articles that were missed had been stolen on several occasions and that on each occasion the heavens presented similar configurations in any respect, it was concluded that such configuration *always* indicated theft. The observer would doubtless admit he was liable to error in his generalization, but yet he claimed to be a conscientious, earnest seeker after truth.

The absurdity of the system may possibly be best illustrated

by pointing out to what minute details of human and animal life and of inanimate nature the influence of the heavenly bodies and of the so-called "houses," extended. The following is a quotation from Raphael (R. C. Smith): "Astrologers attribute to the 6th house an evil signification: it is the house of sickness, and partly of private enemies. . . . In horary questions it represents different effects, being the house not only of sickness, but of servants, dependants, uncles, aunts, and all kindred by the *father's* side; small cattle, rabbits, sheep, goats and hogs; tenants, stewards, shepherds, farmers, etc.; all questions relating to those subjects are judged by the 6th house".

Again speaking of the planet Mars he says:

"In the vegetable world he rules all such herbs as are *hot* and *dry*, or have sharp pointed leaves, or that are red, and usually in barren high stony places, as the thistle, brambles, briars, nettles, onions, lingwort, radish, mustard seed, ginger, pepper, garlick, hemlock, horehound, tamarinds, etc.

"In the mineral world he governs blood stone, load stone, jasper, touch stone, asbestos, amethyst, and adamant; also iron, steel, arsenic, antimony, brimstone, and pungent minerals, of a fiery or inflammable nature".

The curious, extraordinary and incredible differentiation of the subject will be still further shown in the exposition of the system, as a practical method of prognostication, with which I now proceed to deal:

[Professor Baker here explained with some detail the system of astrology, and the method of casting horoscopes. He also exhibited drawings of horoscopes that had been cast by astrologers,—that of the Duke of Wellington, one in answer to the enquiry "whether a lady shall marry a certain gentleman", one respecting the "stealing of some fish", etc. He pointed out how the horoscope, while admitting various interpretations, was usually read so as to fall in with the conclusions of common sense, conclusions that could be reached without the intervention of astrology.]

Recently I was approached by an acquaintance who wished me to cast the horoscope of prohibition, to which he was strongly opposed. I drew the houses and placed the constellations and planets. I found Aquarius, the water-bearer, on the cusp of the

first house, *i.e.*, was in the ascendent, which was sufficiently discouraging. Now Aquarius is the House of Saturn, and Saturn, the most malefic of planets, was therefore the lord of the ascendent, which was another blow.

Now I said, you being the questioner, are represented by Saturn. But I said Prohibition being quite unknown to the old astrologers we must rank it under some more general head which is referred to by them. What, I said, do you say to classifying it amongst pestilences? To this he eagerly agreed. Pestilences belong to the 6th house, and in the 6th house I find Mars which therefore represents the quaesited (Prohibition); and Mars presides over all dry and arid regions. While Jupiter, who might be suposed to favour a reasonable degree of conviviality, is in the evil quartile or square (90°) to Mars, and therefore the universal drought is aggravated. "Enough, enough", cried my enquirer, "'even the stars in their courses fight against us' (Judges v. 20); I must wait for the interregnum, and 'stock up'".

Zadkiel in 1834 cast the horoscope of astrology itself, asking the question, "What shall be its future?"; and predicts that about 1856 the science would rise rapidly in public estimation, and be publicly studied in colleges. It is unfortunate that he had not substituted the present time for 1856; it might then be claimed that I was verifying his prediction. I have no doubt people may be found who will charge that there is a danger of subjects as little useful as astrology being studied in our colleges.

You ask the question can any use be made of astrology to-day? Of course the answer will depend on the definition of utility. You all know how the horseshoe is considered the emblem of good luck; and how, embellished and decorated, it hangs in many houses. I wonder it has not occurred to the skilful decorators to use lucky horoscopes for the same purpose. Surely nothing would so aptly lend itself to needlework. The signs for the planets and constellations are picturesque and mysterious-looking; an artistic fancy could decorate the empty spaces in the houses with infinite variety; and the colouring could be made gorgeous and be strictly astrological. Listen to the following: ♄ gives black; ♃ a colour mixed with red and green; ♂ red or iron colour; ☉ yellow or yellow purple; ♀ white or purple; ☿ sky colour or blueish; ☾ a colour spotted with

white and other mixed colours; ♈ white mixed with red; ♉ white mixed with lemon; ♊ white mixed with red; ♋ green or russet, etc., etc., etc. Fancy how such articles would sell at a bazaar; I am sure I have seen articles less attractive and not more useful for sale at bazaars. At fairs in Germany people can still buy their horoscopes.

Has astrology any other utility? Possibly. As a profession it has much to recommend it. It is easy; quasi-gentlemanly in that it is quasi-scientific; I conjecture very remunerative; not at present crowded; and in the credulity of the public there is a harvest ready for the reapers. Unfortunately it is against the law, at least in British dominions. I think, however, the greater license enjoyed in the neighbouring Republic tolerates it. Some skill in computation, along with an elementary course in astronomy would prepare for the study of the ancient art. It is a question whether an elementary or even an advanced course in ethics would stay the practitioner against the abuse of his opportunities.

TORONTO, ONTARIO.

TELESCOPIC OBSERVATIONS

By Albert R. Hassard

The summer of 1921 has not been over-fruitful in astronomical objects of interest to either the curious or the expert. There have been no new celestial bodies of any serious account discovered, and the public interest has rapidly waned since the expected catastrophe following the collision of the earth with the tail of the Pons-Winnecke comet in June last failed to materialize. The profound silence, which has marked astronomical activity consequently, has been noticeable, and it is to be hoped that it may be merely the prelude to important discoveries in the near future.

During the summer I took out to our summer home on the shore of Lake Ontario, about nine miles west of Yonge Street in Toronto, one of the largest telescopes which, I venture to declare, is to be found outside of the government observatories of Canada. This is a reflecting telescope with the mirror fifteen inches in diameter. The instrument had been in disuse for some years, and was dismounted and in our home attic in the city. Thinking it might be useful at the waterside, I brought it out there one afternoon, and put it together.

For weeks now it has been a source of interest to the spectator, as well as a source of amazement to the stranger. A few years ago a similar instrument at our then summer home on Lake Simcoe was believed to be some kind of cannon to repulse the Germans, should they ever have ventured the imprudency of landing on Canadian shores, and reaching that sequestered place on this western hemisphere. This instrument, built a little differently from most instruments,—the tube being constructed of thin and narrow laths, and being partly of an openwork design,—and standing a little way off the verandah and on the green lawn, has been viewed with much wonder by casual visitors. The tube is about eight feet long, the mirror being of a shorter focal length than is usual, being only ninety-six inches long as against the theoretically suggested length of about ten feet.

Several objects of most pleasing appearance, in addition to the usual objects of observation, have passed within the view in this instrument during the summer.

A most noticeable proof of the world's rotundity has been

demonstrated in the telescope quite repeatedly. Nearly fifteen miles to the south-east of the instrument the great Niagara steamships have been frequently observed when first they would come within the faintest range of vision. The first part to be seen was a tiny cloud of smoke on the distant horizon, which, when viewed with the naked eye, indicated the location where a search might be made for the steamer. Sometimes scarcely anything could be viewed at all. Then the double funnels of one of the boats would begin to appear, and they would seem as if they were rising directly out of the water,—as if they had been placed so as to rest on the crest of the flood. Then their colours would appear,—red, white and black,—and the forecastle of the boat would begin to appear. All the time the hull of the vessel would be entirely hidden over the brim of the lake, curving away out on the vasty deep. In another ten minutes the hull would brighten along the horizon, and in five or ten minutes more, the entire vessel, majestically steaming along would lie there in the eyepiece of the instrument of observation. Generally it would take about thirty minutes, with the boat steaming, possibly at a speed of twenty miles an hour, transversely across the field of vision, but at the same time approaching so that it had gained a distance of about five miles on the observer, and at the close of the observation would be about nine or ten miles away, before the double funnels of the conqueror of the deep would be converted into an entire lake liner plying between Toronto and the Niagara waters.

Often I had been told of the possibility of the masts of ships at sea being seen before the body of the boat appeared in view, but never have I been able to witness this as actually demonstrated until this summer and with the use of the telescope. I have thought masts, without being sheeted with sails would have been too faint to be observed for the purpose of the proof I have mentioned, but with a telescope, magnifying about sixty diameters, this conclusive proof of the rotundity of the earth's surface has been placed beyond the range of contradiction.

On the evening of the twenty-second of September, a "near occultation" of a star of possibly the third magnitude was beautifully visible. The star was to the north of the moon during the passage of earth's satellite in its vicinity, and only about one-fifth

of the moon's diameter distant during the time the moon was engaged in passing its full diameter past the position occupied by the star, which seemed to hang as if mystically suspended on the face of the sky. The star was luminously bright while in the vicinity of the moon, that part of the sky while the moon moved in the neighbourhood being of a whitish colour, much different from the sky in the distance.

Whenever it has been possible to view the moon that orb presented an appearance of gorgeous magnificence, viewed with all powers from about sixty up to nearly four hundred diameters. Great craters seemed as if to suddenly start out of the depths of the moon, and light and shadow coruscated with entertaining magnificence. One visitor said, after ascending the steps necessary to enable him to peer into the wonders which were spread before him, that he saw all that was to be seen the first time he looked into the telescope, and yet after withdrawing from the glass he was constantly attracted to it, the moment he left it he felt some irresistible impulse persuading him to draw near the rapturous vision again and yet repeatedly again.

On the twentieth day of July one of the most magnificent rainbows that has ever been seen was visible in the eastern heavens. It formed a very extended arc of a much larger circle than is usual in the case of rainbows. The appearance was as if an ordinary rainbow, hanging high in the sky had been mysteriously flattened out. The part of the sky in which it hung was very dark, with a heavy curtain of sombre cloud, and the colours of the rainbow were most beautifully depicted on the dusky veil of afternoon. One end of the rainbow descended until it seemed to drop at the observer's feet, or at most only a few yards distant. The spot however was in the waters of Lake Ontario, so that if the proverbial pot of gold which for ages has been proclaimed to be buried at the end of the rainbow be a reality, it would have been necessary to use a boat and employ a diver before that treasure would have made its appearance on that occasion. But for a short time only did the seven-coloured arc of shining loveliness picture itself upon the clouds, for soon the clouds dispersed and the beautiful object faded like a filmy vision into the realms of the unseen.

The close approach of Saturn and Jupiter, an event which

occurs only five times in a century, was witnessed night after night, until eventually both planets, still separated a distance of about two to three degrees, became lost in the consuming effulgence of the sun's bright rays far away towards the golden tinted horizon near the dying of the day.

The usually observed, or, as one might say, the "exhibition" stars, of summer were the occasion of much observation by visitors, and elicited the usual amount of admiration. Among these were Albireo, the beautifully contrasted double star at the foot of the Northern Cross, Alcor and Mizar, the complex system at the spot in the Great Dipper where the handle makes its mighty bend, Theta Serpentis, the almost equally-balanced pair of stars in the constellation of the Serpent, the several doubles near the summer zenith in the Harp or Lyre, the close companion of silvery white Vega, the unequal double Gamma Andromeda, the far away companion of the wondrous first magnitude star Arcturus, Cor Caroli, Beta Ursae Majoris, and many others of exquisite splendour and sparkling light.

Distant objects on land and water also were frequently observed with interested enjoyment. A tug, and its companion scow, whose mighty machinery was engaged at times in excavating a channel in the rocky bottom of the lake, were often the objects which observers scrutinized with watchful care and attention. Birds, among them, the snowy sea-gull with its golden eyes, perched upon distant buoys, the decks of passing steamers, canoes, whose glistening paddles flashed back the rays of the burning sun, the waving branches of leafy trees, the curling amoke from far-away buildings, and a multitude of other objects engrossed the attention of many observers. All seemed to approach the giant telescope with mingled wonder and fear, but they left it, after feasting their eyes upon the wonders which leaped out of its strange depths, with an appreciation of the wonders of heaven and earth written indelibly in their hearts, and perhaps in other days when far removed from a similar opportunity, they will revive in their treasuring recollections the memories of those moments in which wonders hitherto unvisioned were unrolled like a mighty fabric before their ravished eyes.

Toronto, September, 1921.

THE BERKELEY MEETING, PACIFIC DIVISION, A.A.A.S.

By W. E. Harper

The fifth annual meeting of the Pacific Division of the American Association for the Advancement of Science was held at the University of California, Berkeley, from August 4th to August 6th. Some two dozen different Societies are affiliated with the Pacific Division, about two-thirds of which held meetings during these days, where papers were read and discussed relative to their own particular fields of work. In addition there were general sessions in which all participated, with some outstanding person usually addressing the gathering. Approximately 500 members were in attendance from all points on the Pacific coast and as it was the writer's privilege to form one of the number it is felt that a very brief account of the meeting may be of interest to Journal readers.

Following the luncheon on the opening day a brief Research Conference was held to discuss research conditions in California. Dr. Merriam of Washington, D.C., spoke in general terms of the need of research in the readjustment period; Dr. Torrey of the University of Oregon deplored the lack of financial aid for such in Northern Californian institutions, but Professor Noyes presented a cheerful outlook for research in Southern California where the Institute of Technology, under the leadership of Hale, has attracted Millikan and other able men and hopes by working in conjunction with Mt. Wilson observatory to do valuable work on the genesis of matter.

The usual address of welcome was given on the first evening by Mayor Bartlett of Berkeley and responded to by President Barrows of the University, after which there followed the address of Dr. Ritter, the retiring President of the Division, on "Scientific Idealism". The following afternoon a general session was also held at which Professor Russell of Princeton gave a very interesting address on "The Properties of Matter as Illustrated by the Stars".

The Astronomical Society of the Pacific held two sessions at

which about 30 papers were presented. It was in these that the writer was particularly interested but as they will appear in detail no doubt elsewhere only a brief outline will here be given.

Hale discussed sun spots in general and in particular the great spot group of last May with which was associated intense magnetic disturbances and brilliant auroras. The two large members of the group showed mixed magnetic polarities which is somewhat unusual.

By examining some of the Mt. Wilson spectra of sun spots, Russell, who has been a recent visitor to the Pacific observatories, found the rubidium lines at λλ7800 and 7948 which are not visible in the general solar spectrum. This fits in with Saha's ionization theory according to which they should only appear at the lower temperatures.

Mt. Wilson and Lowell observers agreed, in papers presented, that oxygen or water vapour is not present in the atmosphere of Venus. The former photographs were convincing as the large scale of the spectra should show the lines completely separated from those due to the earth's atmosphere.

Campbell presented the results of his measurement of photographs, taken at two solar eclipses, to see if there was any shift of the star images due to the Einstein effect or other causes. Various values from almost zero to 2″.2 were secured from different sets of plates, the final mean being 1″.1, which he very modestly stated should be accepted with reserve.

The writer presented the papers from the Director and other members of this Observatory. Chief among these were the radial velocities of 594 stars of all types determined here with the single-prism spectrograph. One star in every four was found to be a binary and a brief analysis as to type was given. The Callendar Recorders recently installed on the equipment have proved very satisfactory. Reference was made to the work in hand by two of the staff to utilize for spectroscopic parallaxes the spectrograms already secured.

Recent interferometer results by Pease of Mt. Wilson were of interest. Arcturus has an angular diameter of 0″.022 giving on the basis of a parallax of 0″.095 a linear diameter of 21 million miles. Antares was found to have an angular diameter of 0″.040. Its parallax is a little uncertain but the linear diameter would fall

between 300 and 400 million miles, making it larger than Betelgeuse determined last December. An announcement was made by Hale that Michelson hoped by using an artificial diffraction pattern for comparison to determine stars several fold smaller in diameter than was now possible. Merrill has been applying the present equipment to close double stars, independently discovering a very close double of Aitken's. The latter emphasized the value of interferometer method in this regard, stating it to be many, many times as sensitive as the micrometer, with the added advantage of not requiring perfect seeing.

Aitken also referred to his taking over the late Professor Doolittle's work on double stars, the idea being to revise his data, supplement with observations and arrange for publication all measures since Burnham's general catalogue was issued. Three years will be necessary to get it ready for the printer.

Moore and Lundmark discussed the nebular bands in Nova Aquilae No. 3 during this season. They still preserve their sinuous appearance when the slit is in position angle 202°. The red and violet maxima have strengthened relative to the central maxima. The green disk, according to Aitken, is 5.″0 in diameter and expanding at a decreasing rate.

Van Maanen's additional evidence of spiral rotation and many other interesting items might be cited if space permitted. A trip to the Lick Observatory, some 70 odd miles distant, followed on the Saturday afternoon. Steamer connections made it possible for the writer to visit there for a day and a night before the meeting and he wishes here to record the many kindnesses shown him by Director Campbell and the members of his staff during that short stay.

Dominion Astrophysical Observatory,
Victoria, B.C.,
August, 1921.

REPORT OF AN ASTRONOMICAL MEETING IN GERMANY

TRANSLATED BY OTTO KLOTZ

The following is an abstract of a German press report of the international astronomical meeting held at Potsdam, August 24th-27th last.

"After a lapse of eight years the Astronomical Society met again at Potsdam, under the presidency of Professor Strömgren of Copenhagen. Representatives from sixteen nations were present. About two hundred attended the meeting: from Scandinavia, Professor Bohlin, Stockholm; Professor v. Zeipel and Amanuens Asklöf, Upsala; Professor Strömgren and assistant Miss Vinter-Hansen, Copenhagen; from Christiania, observer Lous, and from Finland, Furuhjelm; from Holland the celebrated Professor Kapteyn as well as Van Rhijn and Father Esch; from England the eminent astronomer Professor Eddington, also Father Cortie, S.J.; amongst others may be mentioned Professors Bauschinger, Hartwig, Einstein, Grossmann, Nernst, Runge, Schorr, Wiechert, Prey, Kienle.

Strömgren in his address referred to the continuance of the communication of astronomic phenomena during the years of stress through the instrumentality of the Copenhagen observatory, instead of from Kiel. Copenhagen served also as medium for the exchange of astronomic and scientific literature.

The scientific programme contained many papers showing the progress which astronomy has made of recent years, into details of which we cannot here enter. However, from Father Hagen we learn of the immense masses of dark nebulae; from Kühl (Munich) explanation was given of many hitherto unexplained astronomical phenomena shown in the telescope as well as on the photographic plate; from Zeipel we learn the determination of the masses of the stars in the globular clusters and that they obey the same laws as the molecules in a so-called ideal gas.

Rosenberg reported on the improvement of the photo-electric method for the determination of brightness of stars. The accuracy of measurements approaches the 10,000th of a magnitude. v. Tamm (Sweden) surprised the meeting with an ingenious and simple method for the determination of the colour of stars photographically with a single exposure. The method may be of great importance in astrophysics. Professor Oppenheim (Vienna) presented an interesting theory on the movement of the stars, giving us a new point of view. Dr. Moll (Utrecht) spoke of a new microphotometer for the measurement by means of a thermopile of the distribution of brightness in stellar spectra.

A committee was appointed in connection with an expedition for observing the solar eclipse next year in the Dutch East Indies. It is intended to repeat the experiments of Professor Eddington in connection with the theory of relativity.

An interesting communication was read from the American astronomer, Professor See.

A visit was paid to the celebrated observatories in Potsdam and Neubabelsberg. They were shown also the Einstein tower, a new structure to further test the effect of relativity, the details of which were explained by Professor Freundlich. Professor Guthnick, who has attained a high place in astrophysics, has been appointed director, in succession to the lamented late Professor Struve. The observatory at Potsdam was shown by Professor Ludendorff, who recently has been appointed director of the Astrophysical Observatory. Professor Ludendorff is a brother of the strategist, General Ludendorff.

A visit was paid also to the Geodetic Institute with its many attractions and splendid equipment. At the wireless station the guests had the opportunity and pleasure of listening to the wireless time signals from Annapolis.

One afternoon was devoted to an excursion on the Havel to the Wannsee and Nikolskoe. At a tea in the library an opportunity was afforded for viewing Professor Darmstädter's collection of letters of celebrated naturalists and autographs of noted astronomers.

A unique feature of the meeting was the gathering in the large dome of the Potsdam Observatory, where refreshments were

served and a social evening spent, the success of which was in a large measure due to the ladies of the observatory staff and others.

The four days session passed without a jarring note and all parted with satisfaction at the scientific results that had been brought forth at the meeting and at the pleasure of having again renewed old friendships together with gratitude for the hospitality extended to them at Potsdam.

The next meeting is to be held at Copenhagen."

Dominion Observatory,
Ottawa, September 30th, 1921.

THE HUNGARIAN STATE OBSERVATORY

In the process of settling the boundaries between the new states which were carved out of the old central European nations many difficult problems have arisen, often leading to the very verge of open war. Some of these have yet to be adjusted. As giving an insight into a comparatively small cause of trouble the following statement of the affairs of the Hungarian State Observatory, which has been sent out by Professor A. Tass, its vice-director, will be interesting to JOURNAL readers.

Dear Sir,—I have the honour to inform you, that the Hungarian Government has officially determined the erection of a new Astronomical Observatory in order to promote Hungary's re-entrance in the international net of observatories.

Apprising you of this news, I cannot forbear to briefly dwell on the fate of the observatories founded in the last decades of the past century.

I. The Observatory of Herény, erected by de Gothard, after the death of its founder, was partly sold, partly given away as donation made by the heirs.

II. The Observatory of Kiskartal, founded and maintained by the Baron de Podmaniczky, was first plundered by the Communists in 1919 under the Bolshevist regime, later by the Roumanians and is in ruin to-day.

III. The Haynald-Observatory in Kalocsa has for years ceased operations on account of insufficient means and urgently needs help in order to resume work.

IV. The only Observatory belonging to the Hungarian State: the Astrophysical Observatory de Konkoly-Foundation in Ogyalla, has been taken from us, as Ogyalla is situated in the basin of the left bank of the Danube, which, though inhabited exclusively by Magyars in its whole length of 150-160 km and width of 50-70 km (the rates of the non-Magyars amount to hardly 5% in an average of the Magyars living there), has been allocated to the Cecho-Slovak Republic in conformity with the Peace Treaty.

Deprived of all astronomical observatories, the Hungarian Government, despite the superhuman difficulties it has to cope with, in every respect, felt itself induced to re-establish the de Konkoly-Foundation in mutilated Hungary in order to promote our consolidation in culture.

The reason, why the new Observatory, which is being erected on the "Svábhegy" mountain close to Budapest will continue figuring as de Konkoly-Foundation is that de Konkoly bestowed his observatory on the State in 1899 under the condition, that this institute must serve exclusively Hungarian scientific interests and, above all, it is intended to secure the cultivation and progress of astronomy in Hungary and has to remain the inalienable property of the Hungarian state.

The Hungarian Government is endeavouring to fully live up to all its obligations, and faithful to the memory of the late de Konkoly, who died in 1916, assumes the duty of maintaining his creation according to his intentions. This may be realised the more easily, as, conformable to it, the Government is entitled to remove the Observatory from Ogyalla.

When thus the Cech occupation threatened, and it became known that the occupying forces were removing the cultural treasures of Upper Hungary to Bohemia, the officers of the Observatory considered it their duty to save the instruments of the institute. Lack of time did not permit to save more than the 10, 8 and 6-inch telescopes and a small part of those instruments, which were easily transportable. Part of the instruments, the library and all the equipment and furniture remained in Ogyalla.

The officers of the Observatory also remained in Ogyalla in order to prevent the removing of the fittings left.

When, after the military occupation in the middle of March 1919 the representatives of the Cecho-Slovak State arrived in order to take possession of the institute, we were summoned to enter the service of the new state and to take the oath of allegiance. We denied this and asked to be allowed as "astronomes étrangers" to work up and finish our observations just proceeding. This was promised to us and the promise protocolled. But soon we became aware, that the representatives of the new state did not wish to keep their promise. Nobody cared for the needs of the institute. The publications of foreign institutes have not been admitted, no periodicals have been ordered, not even the *Berliner Jahrbuch*, the electric plants of the institute have not been repaired, the observatory has been occupied by soldiers. Thus we were forced to inactivity in scientific matters. The Cech head of the institute several times tried to transfer to Prague the Library and the instruments still left and only my vigorous protest induced him to desist from this purpose. In order to avoid further unpleasant controversies, we informed the Cech Government in Prague, in the middle of last year, that we would leave the institute. This was our starving method, as the Cech Director called it.

At the end of December last we left Ogyalla and came to Budapest in order to begin the preparatory work for the erection of a new astronomical observatory. For this purpose the capital Budapest ceded a ground of 40,000 square metres on the plateau called "Svábhegy", 460 metres in height, belonging to Budapest. The first work will be the erection of a small meridian building and a dome for the 8-inch telescope. In this way we hope to restart observations this year again.

At the same time diplomatic steps have been taken to effect the restitution of the instruments, equipment and library which remained in Ogyalla, on the ground of the explicit and indubitable statements of the deed of foundation. We do not know in how far these attempts will be successful. Having disclosed to you, dear Sir, our sad situation, I take the liberty of applying to you with the request to kindly grant us your support in our efforts.

Thoroughly deprived of all literary resources, I beg to ask you above all to furnish us with the full series of the publications of your institute; besides we

should be very grateful if you will let us have the duplicates of mathem.-physical works you can do without. Finally we most respectfully request you to send us lantern slides representing celestial objects and observatories.

I hope that you, dear sir, will fully appreciate our requests and as far as possible comply with them. Peace has been concluded. Hungary, politically and militarily having been bound to the policy of the Habsburg, and not having had any right of self determination, cannot be made responsible for the war. We were the victim of the Austrian-Cech policy. Our situation in the past is clearly illustrated by the following fact. The former well-known "K.u.K. Militär-geographisches Institut" in Vienna, to the maintenance of which we contributed many millions in the course of years, has not accomplished 2% of the part of the survey which concerned Hungary, although 40% of the expenses for its maintenance had been contributed by Hungary. In all other matters our role was a similar one. We were obliged to bring sacrifices without any recompensation and at last we became the lamentable victim to our sacrifices.

I still venture to recommend to your benevolence the requirements of our new institute which at present is in its initial stage.

PROF. A. TASS.

MEETINGS OF THE SOCIETY

MINUTES OF THE MEETINGS OF THE SOCIETY

The Editor is pleased to receive minutes of the meetings of the Centres of the Society, and requests that they be sent in without delay. The "copy" for the JOURNAL must be given to the printer several weeks before it is issued but the reports will be printed as promptly as possible. The secretary of the Montreal Centre, which, by the way, is increasing its membership in a gratifying manner, is to be congratulated for being the first to send in minutes for this autumn's meetings. The secretaries are requested to send the minutes in a form suitable for printing. Omit purely formal and local matter but give a brief account of everything of general astronomical interest. C. A. C.

AT MONTREAL

September 27.—The meeting was held in the Physics Building of McGill University, the President, H. E. S. Asbury, in the chair. There was an attendance of 42. Three nominations for membership were made.

The President acknowledged receipt from Professor C. A. Chant by the Vice-President, Mr. Justice Howard, on behalf of the Society, of a photograph of the instrument built and used by the late Father Kavanagh in the expedition to Labrador to observe the total eclipse of the sun in 1905. Upon motion of Rev. W. T. B. Crombie, the members passed a resolution of thanks to Professor Chant. The secretary was requested to send Professor Chant a copy of the resolution and to place the photograph among the archives of the Society.

The speaker of the evening was Rev. W. T. B. Crombie, who gave an illustrated address on "Nebulae". Mr. Crombie pointed out that the discovery of nebulae was of comparatively recent date, as when examined through the earlier telescopes they were thought to be simply star-clusters far distant, and that with the advent of telescopes of greater power, these nebulae would be more clearly resolved.

The speaker paid a great tribute to the work of Sir Wm. Herschel who, notwithstanding his crude instruments, advanced the number of known nebulae from 103 to over 2,000. His son increased the number to over 5,000.

Earl Rosse upon completion of his telescope in 1845 carried further the study of nebulae, but the greatest advance came with the discovery of the spectroscope, when splendid work was done by Sir Wm. Huggins. Mr. Crombie described the

different forms of nebulae, paying particular attention to the spiral nebulae, thought by some to be "island universes". He dealt very carefully with the nebular hypothesis, stating the deductions or reasons in its favour; but at the same time pointing out the difficulties due to apparent facts operating against its complete acceptance. A number of lantern views were shown illustrating in particular the various forms of nebulae.

H. E. MARKHAM, *Recorder.*

AT TORONTO

October 4.—The Society met in the Physics Building of the University at 8 p.m., the President, Mr. J. R. Collins in the chair.

The following were elected members of the Society:
Mrs. Lilian A. Wisdom, 322 Brunswick Ave., Toronto.
Mr. F. T. Stanford, 78 Wells Hill Ave., Toronto.
Mr. D. A. Dunlop, 93 Highland Ave., Toronto.
Mr. F. Armour, 501½ Sherbourne St., Toronto.
Mr. J. G. Griffin, Carlton near Sydney, N.S.W., Australia.
Rev. Christopher Lord, Bala, Muskoka, Ontario.
Rev. H. F. Deller, B.A., Port Dover, Ontario.
Mr. Geo. E. Buscombe, Jr., 2050 Comox St., Vancouver, B.C.

The Librarian reported that 180 periodicals had been received during the summer months. Of these 100 were from Canada and the Empire, 52 from the United States, and 28 from various other countries.

The meeting was then thrown open for the report of observations. Mr. A. F. Miller reviewed the sun-spot activity during the summer. He had observed a large number of spots by means of his projecting apparatus, which was described in the July-August issue of the JOURNAL. Dr. C. A. Chant read an interesting article by Prof. H. N. Russell in the *Scientific American* of September 3rd, describing the bright object seen about 2° from the setting sun on August 8th. This body was also seen by two observers in England, on the same day; and it is now generally believed to have been a transitory comet. Dr. Chant also drew attention to Prof. H. D. Curtis' paper in *Science* for September 30th on the audibility of the aurora. When there is so much discussion on this point, it is very pleasing to have the decided evidence of such a practical observer. A few extracts were read from the book "Percival Lowell—An Afterglow", a biography of the late Director of the Flagstaff Observatory written by his secretary Miss Louise Leonard.

Mr. A. F. Hunter described the peculiarities of the aurora of September 28th. As many as five arcs formed in the northern sky and travelled towards the zenith, the arcs being so bright as to dim the stars. There were no streamers except a few faint ones towards the end of the display.

An interesting discussion followed the reports of the observation.

J. A. PEARCE, *Recorder.*

NOTES FROM THE METEOROLOGICAL SERVICE

Temperature—August 1921

The temperature was average or little below over the Dominion except at a few points in Southern Alberta and in Ontario where the average was slightly exceeded. There were no positive departures reported exceeding 2 degrees and no negative departures of more than 3 degrees.

Precipitation

The precipitation was above the average in parts of British Columbia and Manitoba, quite locally in Ontario and to a more general extent in Northern and Eastern Quebec and Northern New Brunswick, elsewhere in the Dominion it was below the average. The positive departures except in a few isolated places were less than an inch while some of the chief negative departures were Prince Albert, Sask., 1.40 inches; Port Arthur 2.60 inches; Halifax 2.00 inches; Sydney 2.50 inches.

SEISMOLOGICAL NOTES FOR AUGUST 1921

Toronto and Victoria recorded only three disturbances during the month, the largest being on the 23rd, Victoria showing a trace amplitude of 2.7 mm. and Toronto, 2.0 mm. The distance of this earthquake centre form Toronto was 3,610 km.

On the 27th an earthquake was felt in Quebec Province. Montreal reports a slight shock, Class V, felt at 3h. 15m. Standard time. Duration 10 seconds. Distant rumble, slight vibrations.

Bell Falls' Power House, Class III, at 3h. 15m. Duration 12 to 15 seconds. Rumbling sounds. The observer states it wakened him out of a very sound sleep. Persons a mile away from the Power House also felt the shock.

Sorel. Intensity, Class V, at 3h. 15m. Slight vibration of light furniture, tables, chairs, beds. Many sleepers were awakened.

The earthquake was also felt in Joliette. Duration 4 to 5 seconds. Direction from the West to the East. Moderate sounds, furniture moved and window panes were broken. J. Y.

Magnetic Disturbances—June, July, 1921

During the months of June and July the Magnetic records at both Agincourt and Meanook indicate a very quiet period in the Earth's Magnetic forces.

Active sunspot groups were centred on the Sun's visible surface on June 9th and 29th and July 7th and 30th.

Very few aurora were reported by Dominion Meteorological observers during either month and they were of a low order and were mostly during the first week of June.

W.E.W.J.

TEMPERATURES FOR MONTH OF AUGUST, 1921.

STATIONS	August Highest	August Lowest
Yukon		
Dawson	88	8
British Columbia		
Atlin	72	34
Agassiz	90	45
Barkerville	74	33
Kamloops	96	44
New Westminster	84	48
Prince Rupert	70	45
Vancouver	82	46
Victoria	76	48
West Provinces		
Battleford	93	40
Calgary	92	36
Edmonton	81	37
Medicine Hat	96	44
Minnedosa	91	34
Moosejaw	82	49
Oakbank	91	39
Portage la Prairie	87	41
Prince Albert	86	36
Qu'Appelle	94	31
Regina	96	34
Saskatoon	95	37
Souris	95	39
Swift Current	98	48
Winnipeg	94	41
Ontario		
Agincourt	89	45
Oak Ridges	88	47
Bancroft	82	35
Barrie	83	45
Beatrice	82	35
Bloomfield	85	46
Brantford	..	..
Chapleau	77	30
Chatham	93	49
Clinton	84	43
Collingwood	87	45
Cottam	..	..
Georgetown	85	45
Goderich	..	..
Gravenhurst	..	..
Grimsby	92	47
Guelph	86	42
Haliburton	86	35

STATIONS	August Highest	August Lowest
Ontario—cont.		
Huntsville	84	38
Kenora	85	43
Kinmount	..	..
Kingston	84	52
Kitchener	86	42
London	92	45
Lucknow	86	39
Markdale	..	..
North Gower	87	42
Oshawa	..	..
Ottawa	88	46
Paris	90	17
Parry Sound	94	43
Peterborough	88	45
Port Arthur	92	42
Port Burwell	..	..
Port Dover	85	48
Port Stanley	88	40
Queensborough	87	43
Ronville	84	39
Southampton	82	42
Stonecliffe	95	42
Stoney Creek	92	43
Toronto	91	47
Uxbridge	87	42
Wallaceburg	88	40
Welland	85	45
White River	84	30
Quebec		
Brome	84	40
Father Point	82	38
Montreal	87	50
Quebec	83	45
Sherbrooke	85	40
Maritime Provinces		
Charlottetown	84	48
Chatham	86	42
Fredericton	80	40
Halifax	80	46
Moncton	85	38
St. John	77	46
Sussex	82	37
Sydney	82	42
Yarmouth	74	44

BOOK REVIEWS

Die veränderlichen Sterne, von Johann Georg Hagen, S.J., Direktor der Vatikan-Sternwarte, 4 Lfg., I Bd. Freiburg im Breisgau, 1921, Herder & Co.

This is the last part of volume I of Father Hagen's great work on Variable Stars, and comprises pages 519 to 812. The seven chapters deal with the elements of the light-variation in general, the amplitude of the light-oscillation, epochs and principal phases, lengths of periods, form of the light curve, colours and colour-changes, and general laws of the light-variation. Appendices giving the values of the "grades" of various observers, and the Julian days from 1801 to 2000, as well as an excellent index, are added.

This computes the first volume, which is devoted to the historical and technical side of the subject. It contains a wealth of information and undoubtedly will be the standard work on variable stars for many years. In these days of the high cost of printing and the use of inferior paper it is a pleasure to see the large type, broad margins and superior paper of this monumental work.

Rapport sur une Expedition d'Aurores Boréales à Bossekop et Store Korsnes pendant le Printemps de l'Année 1913: and

Exemples de Rayons Auroraux dépassant des Altitudes de 500 kilometres au-dessus de la Terre: by Carl Störmer. Kristiania, 1921.

The former is part 5 of vol. I and the latter is part 2 of vol. II of the Geophysical Publications of the Norwegian Geophysical Commissiom.

We have had many vague speculations as to the nature of the aurora, some of them undoubtedly containing germs of truth, but the only way to make certain progress is to base one's theory on actual measurements of the phenomena observed. A great contribution to the supply of such measurements has been made by Störmer. In 1910 he made an expedition to the north of Norway to secure simultaneous photographs of the same display taken at two points a considerable distance apart. From such the parallax

of any point can be determined and the height calculated. The results were very good, and three years later a second expedition was undertaken, which was even more successful. Since that time other measurements have been made by Störmer and several assistants living in places 26 to 250 km. away from Kristiania.

Summaries of the results obtained have already been published, but here we have a full account of the preparations, the observations and the calculations. The first publication extends to 269 printed quarto pages, followed by 104 plates; the second contains 5 pages and 2 plates.

The average height of the auroras photographed was about 110 km., but some were more than 500 km. above the earth's surface.

Percival Lowell: an Afterglow, by Louise Leonard. Boston, Richard G. Badger (The Gorham Press), 164 pages, 5¾×8½ in., 1921. Price $2.75.

This beautifully printed book, with its numerous fine plates, will appeal to a wide circle of readers. The first 42 pages contain a brief sketch of Dr. Lowell's life, and the remainder is made up of quotations from his personal letters. Thus is furnished a picture which his friends will at once recognize as the real Lowell.

Miss Leonard, the author of the memorial, is especially qualified for offering this tribute here given. For a long time she was associated with Dr. Lowell, not only as a member of his observatory staff, but also in direct connection with him, as his confidential and executive secretary. Miss Leonard became familiar with his varied aims, characteristic moods and methods of work of the man. In this tribute, consequently, Dr. Lowell appears not only as the scholar, fully equipped and at work in research and letters, but as an interested American scientist, as an acute observer and critic, as finding particular pleasure in the world of nature directly about him, as well as in celestial distances.

C. A. CHANT

NOTES AND QUERIES

Communications are Invited, Especially from Amateurs. The Editor will try to Secure Answers to Queries

"LIFE ON MARS" AGAIN

The Editor has been asked to give his opinion upon a projected telescope 50 ft. in diameter which it is proposed to use to photograph Mars during its opposition in 1924, at which time the planet will come very near to the earth. The information is given in a newspaper despatch from Paris and is credited to "B. McAfee, United States scientist and collaborator with David Todd". Mr. McAfee, who apparently is living in France, says:

Professor Todd found a mine shaft at Chanaral, Chile, over which Mars will be at its zenith several times in 1924. We intend to use the shaft as the barrel of the telescope. It will be fifty feet in diameter. The difficulty of a glass mirror will be obviated by the use of an invention of mine, a flat sheet iron dish fifty feet in diameter, on which mercury will be poured.

When the dish is rotated at a certain speed the surface mercury assumes the necessary concavity and forms a splendid mirror. Owing to the great luminosity the telescope will give we will be able to make a snapshot, instead of a time exposure. A magnification of twenty-five millions will be possible, bringing Mars within a mile and a half. I am convinced that life exists on Mars, and expect to prove it.

Very interesting experiments on mercury mirrors were made by R. W. Wood, and are described in the *Astrophysical Journal* for 1909, vol. 29, p. 164. Wood obtained some creditable results with a mirror 20 inches in diameter. Some difficulty was experienced in rotating the dish with absolute uniformity and any irregularity changed the curvature of the surface and, of course, the focal length of the mirror. It is a far cry from a 20-in. mirror, which was of little value astronomically, to one 50 feet in diameter, and one can only tender best wishes to Mr. McAfee.

AUDIBILITY OF THE AURORA

The present writer for some years has been interested in collecting information regarding the audibility of the aurora, and lately was pleased to obtain some further evidence on the question.

In a note from Mr. H. E. S. Asbury, President of the Montreal

Centre of the Society, reference is made to a book entitled "Ten Thousand Miles by Dog Sled", by Hudson Stuck, F.R.G.S., who says that many residents and travellers in Alaska, men whose word and statements are worthy of belief, claim that they have heard the aurora "swish" across the sky.

Mr. Asbury continues:

My diary records that I heard the aurora crackle in a very brilliant display witnessed one evening in Woods Harbour about 11 o'clock. We were ashore, and after our evening meal lay about a great fire; it was the most wonderful display we had ever seen.

I remember two remarkable displays of the aurora, one seen in Durham, Grey Co., about 1884; and the other in Brampton, Peel Co., in 1893, I think. In both of these, rays of rose, green and yellow shot up to the zenith, covering the whole sky, but leaving a circle about 10° in diameter clear in which a pale yellowish-gray cloud flickered in and out. When the rays seemed to merge into one another and shift about, I distinctly heard sounds, which I would liken more to the "click" made by a comb drawn through the hair, than a "swish". This sound I heard on both occasions.

The most remarkable display I ever witnessed was at Niagara-on-the-Lake in July 1892, after about six weeks of drought and intense heat. About 11 p.m. I noticed a bank of ruby red hanging over the Lake, and, while watching this, suddenly the whole sky was covered by purplish billows of light, which kept flickering in and out and shifting about for about half an hour.

In *Science* for September 30, 1921, is a letter signed by Dr. H. D. Curtis, director of the Allegheny Observatory, giving further evidence on this matter. As Dr. Curtis is an experienced and competent observer his statement should carry exceptional weight. The entire letter is as follows:

The existence of sounds in connection with manifestations of the aurora is regarded by many as still a moot point, *cf.* the remarks at the close of the article on the subject in the "Encyclopedia Britannica".

Several observers have reported hearing such sounds during the very brilliant auroral display of May 14. I could not detect any such sounds on this occasion, doubtless owing to the proximity of a large city from which the volume of sound, even at 3 a.m., is quite noticeable.

I desire to place on record, however, certain earlier experiences under almost perfect conditions of isolation and quiet. While in charge of the Labrador station of the Lick Observatory-Crocker Eclipse Expeditions of 1905, much of the work of adjusting the instruments was necessarily done at night. The station was located at Cartwright (latitude +53° 42'), and auroral displays were frequent and bright during July and August. On several nights I heard faint swishing, crackling sounds which I could attribute only to the aurora. There were times when large faintly luminous patches or "curtains" passed rapidly over our camp;

these *seemed* to be close and not more than a few hundred feet above the ground, though doubtless much higher. The faint hissing and crackling sounds were more in evidence as such luminous patches swept over us.

AN ORRERY AT THE BREAKFAST TABLE

(By C. R. COUTLEE)

Possibly an easily understood picture of the universe may be gained in the following manner:

Imagine an almost circular dining-table 6 ft. in diameter. Our sun would be represented by a small cherry, ¼ inch in diameter, in the centre, while the earth would be a dust particle upon the edge.

On 21st June we are at (say) the south end of the table, on 21st September halfway up the east side, on 21st December at the north end, and on 21st March halfway down the west side. Our speed is about 18 miles per second for 365 days.

The planets may be visualized on the same scale by a speck 1 ft. out from the cherry for Mercury, 2 ft. for Venus, 3 ft. for our earth, 4½ ft. for Mars, 16 ft. for Jupiter, 30 ft. for Saturn, 60 ft. for Uranus and 90 ft. for Neptune. The moon's distance would be less than an ⅛ inch from the earth.

Although the 90 odd million miles from the sun in the centre of the table to the earth on its edge, is represented by only 3 ft. the North Star is, on the same scale, 1800 miles away. From Ottawa it would be necessary to extend the table northwards to Ungava and from Vancouver to the north boundary of British Columbia, before rising 1600 miles vertically to Polaris. The earth's axis points to this star, hence its axis is always parallel to itself as it whirls around its tiny orbit. Point a knitting needle almost vertically toward the star and roll it around the table edge.

The blazing Dog Star and Procyon would be 300 miles from the table, Altair 600 miles, Vega 800 miles and Aldebaran and Capella about 1000 miles distant. Stars in Orion, Virgo and Leo are immeasurably further away than Polaris, which is more than three million times further away than the sun.

AURORA, 2ND SEPTEMBER, 1921

(By C. R. Coutlee)

To be awakened at three in the morning by a barking, coughing, shunting locomotive is anathema. Yet, till the rude ancient methods of steam give way to the electrification of city freight yards, we must endure. It is to be philosophical, however, and look at the sky, when life will be quite worth while again. It certainly was on 2nd September at Ottawa, Ont., to view the aurora.

A great gray gas bombardment was in progress from the north western horizon between Vega and Altair to the zenith. From the south west scintillating cloud wraiths dashed upwards seemingly to oppose the others and in the collision the sky was filled with feathery plumes dancing right and left. From the south-west horizon horizontal bands advanced upwards in serried pulsations till one was awed by the immensity of the display.

At times the whole constellation of the Swan was obliterated and the feathery form dashed over Pegasus. In the opposite quarter the general direction seemed parallel with Orion's belt and through Taurus.

Colour was absent and the swishing silky noise could not be detected. The duration was about an hour and although remarkably clear at that time there was a shower before eight o'clock.

C. A C.

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